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PSYCHOLOGY.

Mutualists.—Many animals which are found associated with other animals and which are usually termed parasites are, in fact, true mutualists. I mean by the term, mutualist, an animal which gives a *quid pro quo* or specific beneficial service to the host which affords it sustenance and domicile. A true parasite feeds on the food or the physical juices and structures of its host without rendering any reciprocal service whatever. Thus, the family *Pediculidæ* (*P. corporis, P. capitis, etc.*), found associated with man, are true parasites, while the family *Ricinicæ,* found associated with birds, are true mutualists. I am fully aware of the fact that I antagonize the opinions of entomologists (who regard all these little creatures as parasites which are to be destroyed as soon as discovered, inasmuch as they consider them detrimental to the health of the animals upon which they are found), for I consider most of them absolutely necessary to the health and well-being of their hosts, and their absence to be an indication of disease in some form or other in those animals on whose bodies they are not to be found. Careful observation has taught me that these faithful little hygeinic servitors immediately abandon the bodies of fowls which are the victims of cholera and kindred diseases. Porcine mutualists behave in a like manner when their hosts become diseased. I had thought with others until recently, that these corporal scavengers and toilette assistants were parasites, but systematic and painstaking observation has taught me otherwise. In the first place, microscopic examination shows that these creatures have no suction apparatus like fleas (*Pulex*) and lice (*Pediculus*) for the purpose of sucking up the blood and juices of their hosts. Their jaws are usually armed with a simple pair of incurvated scrapers with which they scrape the surface of their hosts' bodies. Their stomachs never contain the blood of their hosts, but are always filled with exfoliated epithelium and kindred superficial debris. Supported by these observations alone, the fact at once becomes evident that these creatures are not true parasites ; but there is yet more testimony to be adduced in favor of these hitherto maligned coadjutors and promotors of animal hygiene. If one carefully separates the feathers on the body of a fowl and uses a good lens (10 diam.) he may observe *Liothe pallidum,* a true mutualist, busily engaged in removing exfoliated epithelium (scarf-skin) from the body of its host. It thoroughly cleans its allotted area, scraping away and swallowing all of the waste products of the skin. Again, if the feathers themselves be examined, another mutualist (*Liothe saculatum*) may be seen freshening and beautifying their sheen by taking into its stomach all dead epithelial cells, etc., with which it comes in contact. Mutualists are found everywhere in nature, and wherever found are of essential service and benefit to the animals possessing them. From the giant cetacean to the microscopic rhizopod, from the savage lion to the timid field-mouse, from the kingly eagle to the tiny humming bird, no animal is without them. Butler's epigram:

> "Big fleas have little fleas upon their backs to bite 'em;
> And these fleas have other fleas and so *ad infinitum*."

is mainly true, only I insist that no true mutualist ever bites its host. Many mutualists never reside wholly with their hosts, but visit them occasionally to render them needful service. The famous crocodile bird visits its host in order to pick its teeth; Buphagus, the surgeon of the buffalo, alights on the back of its host, and, with its sharp, lance-like beak opens the cells of encysted larvæ and removes them; the European starling performs a like service in removing "wolves" from the backs of cattle.

In matters of the toilette many animals are entirely dependent on the ministrations of mutualists. This is notably the case with many of the fish family. I placed two gilt catfish, whose skins had been thoroughly cleaned with a solution of salt water and borax, in a tank of filtered water in which there were no *Gyropeltes*, the mutualists of this species of fish. In two days their skins had lost their beautiful golden sheen and had become dull and lusterless. The fish themselves clearly showed by their actions that they were not in good health. They remained at the bottom of the tank almost without motion. I then took them out and found that their skins were covered with a slimy mucous exudate. I placed them for a few moments in a tank of pond-water in which there were multitudes of *Gyropeltes*. After allowing them to remain in this tank for a few moments, they were removed and examined, and thousands of these mutualists were discovered greedily devouring the mucous. After a day's residence in the pond water their skins had recovered all their lustre and beauty, and the fish showed by their actions that they had regained their health. A truly remarkable mutualist is found associated with the crayfish. It belongs to the genus *Histriobdella*, and its office is analagous to that of the vulture, the jackal, and the burying beetle which remove carrion. It is exceedingly agile and is altogether one of the most unique in appearance of all animals. It may be described as a two-legged worm, which has all the powers of a most accomplished contortionist. The crayfish, after oviposition, carries its eggs beneath its tail, and the *Histriobdella* lives among them. Its office or function is to devour all blighted or unimpregnated eggs and dead embryos, the decay of which might affect the health of its host and progeny. Van Beneden, describing the *Histriobdella* found associated with the lobster, says: "Let us imagine a clown from the circus, his limbs dislocated as far as possible, we might even say entirely deprived of bone, displaying tricks of strength and activity on a heap of monster cannon balls, which he struggles to surmount; placing one foot formed like an air-bladder on one ball, the other foot on another, alternately balancing and extending his body, folding his limbs on each other, or bending his body upward like a caterpillar of the family *geometridœ,* and we shall then have but an imperfect idea of all the attitudes which it assumes, and which it varies incessantly." I once saw one of these little animals stand erect on its legs, then bend its body down between them and, with a quick flirt, turn a complete summersault. I have repeatedly seen this mutualist insert its proboscis into the eggs of crayfish and devour them. Microscopic investigation always showed that the eggs thus attacked were unimpregnated, consequently unfertile. I might prolong this paper by introducing many other mutualists, but think it hardly necessary. I have shown that these creatures subserve a very useful purpose in nature, and that they do not belong to that disreputable class—the parasites.—JAS. WEIR, JUN., M. D.